A Comparison of Opioid Versus Opioid Free Anesthesia in Orthopedic Surgery

Jessica Peters RN, SRNA
Faculty Advisor: Dr. Jessica Tomasiewicz

Abstract

The debate regarding opioid anesthesia (OA) versus opioid free anesthesia (OFA) is a hot topic in today's anesthesia community. There is no denying the multiple adverse outcomes that can occur from OA and the fact that opioids have contributed to an epidemic in the United States. The pros and cons of OA versus OFA will be explored in this project's literature review. This project will also compare post operative pain scores of 20 patient charts from a busy hospital system in the Midwest region of the United States of patients that have received OA versus OFA during orthopedic surgery. The data collected will be utilized to analyze if there is a significant difference between the pain scores of the two modalities during the postoperative Phase I of care and if one modality required more narcotic(s) during Phase I care.

Framework, Methodology & PICOT Question

The theoretical model behind this quality improvement project is the Plan-Do-Study-Act (PDSA) model for improvement (Institute for Healthcare Improvement [IHI], n.d.). The PDSA model is effective at testing and learning about change on a small scale. This scale helps fit into the assessment of OA verse OFA.

This was a retrospective data analysis including twenty chart reviews of patients that received orthopedic surgery from the same surgeon. From these charts, the modality of anesthesia performed (opioid vs opioid-free) was determined and their post operative pain scores and whether they required narcotic administration in Phase I care, prior to transferring to Phase II care, was compared. Then the data was analyzed to determine if there was a significant difference in postoperative pain scores of patients that received opioid vs opioid-free anesthesia.

The PICOT question for this project was: Do patients undergoing orthopedic surgery (P) that received opioid free anesthesia (I) report lower pain score numbers, on a 0-10 numeric scale, post operatively (C) versus patients that received opioid anesthesia (O) prior to transferring to phase II care (T)?

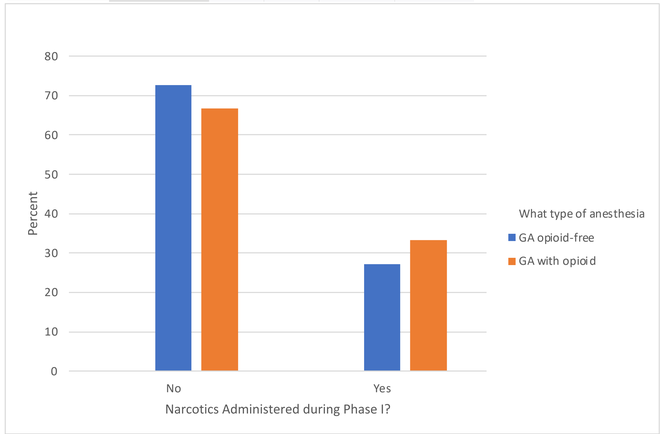
Review of Literature

When comparing intraoperative OA to OFA there appears to be more advantages to OFA than OA. Current reviews list multiple adverse outcomes from OA. There have not been long term studies regarding the results of OFA but the benefits and focus is there, and the benefits seem to outweigh the negatives of OA.

- Brummett et al. (2017) stated that about 530 people die every week in the United States due to opioid overdose and that many patients receive their first exposure to opioids following surgery. Utilizing a nationwide insurance claim data set from 2013 to 2014, 36,177 US adults aged 18 to 64 years old, without opioid use within 1 month prior to a minor or major surgical procedure, were screened to see if they continued to utilize opioids for more than 90 days after surgical procedures (Brummett et al., 2017). Brummett et al. (2017) found that the rates of new, persistent opioid use more than 3 months after surgery ranged from 5.9 to 6.5%. New and persistent opioid use is not different among patients that received minor or major surgeries, showing that its use is a previously underappreciated surgical complication, that is not entirely due to surgical pain. (Brummett et al., 2017). Brummett et al. (2017) found risk factors for new, persistent opioid use among opioid-naïve patients in their cohort included: those that smoked tobacco, alcohol and substance abuse disorders, anxiety, depression, preexisting pain disorders, and comorbid conditions, regardless of the surgery they received.
- While the need to resolve increased opioid use is necessary, we must not ignore the issue of inadequately treated pain and its consequences that can lead to persistent post-surgical pain (Shanthanna et al., 2020). Shanthanna et al. (2020) points out other factors that play a role in postoperative pain control and these may include anxiety, depression, catastrophizing-coping, preexisting opioid use, smoking, chronic pain, and frailty. The preoperative phase can be utilized to assess, triage, and modify any of these factors that can be addressed (Shanthanna et al., 2020). Shanthanna et al. (2020) states that opioids cannot be completely eliminated in the perioperative setting but minimizing opioid use with known, safe, feasible options, adapted to individual patient needs is encouraged.
- Shing et al. (2021) developed and tested an opioid-free perioperative analgesic pathway for patients undergoing common elective orthopedic procedures, in hopes that it can be replicated and incorporated into future studies at other institutions with the goal of aiding the recent efforts in reducing the impact of prescription opioids on the opioid crisis. This study is believed to be the first to evaluate the safety and efficacy of utilizing a completely opioid-free (OFA) perioperative protocol (Shing et al., 2021). Preoperative medication given for OFA varied by each orthopedic surgery subspeciality but could include PO gabapentin, PO or IV Tylenol, PO meloxicam, if <75 years old scopolamine patch, spinal (for hip surgeries); IntraOp options included block(s) with local anesthetic injection(s), IV toradol, Zofran, decadon; PACU options included cryotherapy, IV or PO Tylenol; and postop options included cryotherapy, IV Toradol, IV or PO Tylenol, gabapentin, meloxiam (for hips only), and decadron (for hips only (Shing et al., 2021). Pain assessments were obtained at 6, 12, and 24 h post-surgery. The final study results are not available yet and will be published in a peer-reviewed, PubMed-index journal to reach healthcare professionals (Shing et al, 2021).
- Prior to conducting their own study, Bell et al. (2020), hypothesized that OFA and opioid anesthesia (OA) groups would not significantly differ in pain scores or long-term opioid prescription utilization, but the OFA group would have a shorter post ambulatory care unit (PACU) duration and a lower morphine equivalent dose (MED) in the postoperative period. The outcome of Bell et al. (2020)'s study was unable to show significant differences regarding the OFA and OA groups regarding their three outcomes: PACU duration of stay, opioid use in the 12-hour postoperative period, and opioids dispensed 90 days postoperatively. However, age, postoperative pain intensity, and 3-month opioid prescription history had a positive association; every 1-year increase in age was associated with a 5.06 increase in PACU length and a 5.73 increase in opioid use during the 12-hour postoperative period (Bell et al., 2020). A review of anesthesia closed-claims reflects that most opioid-related respiratory events occur within the first 24 hours postoperatively, based on that review, OFA could be an option to reduce this adverse event (Bell et al., 2020).
- High doses of intraoperative opioids may result in opioid-induced hyperalgesia and increased postoperative pain so it is important for anesthesia providers to utilize neuraxial techniques, regional techniques, and multimodal analgesia which can include nonopioids such as ketamine, intravenous lidocaine, and dexmedetomidine (Dunn et al., 2017).

Results

	Type of anesthesia	N	Mean	Std. Deviation	Std. Error Mean
Pain score in preop	GA opioid-free	11	2.09	2.166	.653
	GA with opioid	9	2.33	2.291	.764



			What type of anesthesia GA opioid-free	GA with opioid	Total
Narcotics Administered during Phase I?	No	Count	8	6	14
		% within Narcotics Administered during Phase I?	57.1%	42.9%	100.0%
		% within What type of anesthesia	72.7%	66.7%	70.0%
		% of Total	40.0%	30.0%	70.0%
	Yes	Count	3	3	6
		% within Narcotics Administered during Phase I?	50.0%	50.0%	100.0%
		% within What type of anesthesia	27.3%	33.3%	30.0%
		% of Total	15.0%	15.0%	30.0%
Total		Count	11	9	20
		% within Narcotics Administered during Phase I?	55.0%	45.0%	100.0%
		% within What type of anesthesia	100.0%	100.0%	100.0%
		% of Total	55.0%	45.0%	100.0%

- Pain scores were very similar (~2 out of 10) in Phase I care among both OFA and OA patients.
- 3 out of 11 patients that received opioid-free GA were administered narcotics in phase I recovery.
- 3 out of 9 patients that received GA with opioid(s) were administered narcotics in phase I recovery.
  - The same number of patients that received opioid-free GA and GA with opioids required narcotics in phase I recovery.

Limitations & Conclusion

The greatest limitation to this study was the small sample size. It would be beneficial to replicate this study with a larger sample size. Weaknesses include anesthesia provided by multiple providers, and that the study results occur at two different sister hospitals, with two different cultures regarding postoperative patient care and pain control.

Avoiding or reducing perioperative opioids, when possible, while providing adequate analgesia, seems like a logical and achievable goal for anesthesia providers. Enhanced recovery protocols utilizing multimodal analgesics have also been shown to reduce opioid consumption throughout the perioperative period and after discharge which, in turn, decreases morbidity and length of hospital stays (Dunn et al., 2017). Enhanced recovery after surgery (ERAS) protocols are being used to decrease opioid use in the perioperative period but it is important that studies also look at the effects of opioid-free anesthesia (OFA) on postoperative outcomes (Bell et al., 2020). Enhanced recovery protocols utilizing multimodal analgesics have also been shown to reduce opioid consumption throughout the perioperative period and after discharge which in turn decreased morbidity and length of hospital stays (Dunne et al., 2017).

Wu et al. (2019) states there is insufficient data to determine benefits and harms of opioid-free anesthesia as opposed to opioid minimization but there have been no emerging safety issues with opioid-free anesthesia, making it very feasible in carefully selected patients and procedures. There have not been any associated adverse outcomes of OFA determined yet. Every healthcare institution should be looking at ways to eliminate, or even simply decrease opioids given in the perioperative phase.

References

Bell, A., Andrews, C., Highland, K. B., & Senese Forbes, A. (2020). Opioid-free anesthesia in the perioperative setting—a preliminary retrospective matched cohort study. *Military Medicine*, *187*(3-4), e290–e296. https://doi.org/10.1093/milmed/usaa570

Brummett, C. M., Waljee, J. F., Goesling, J., Moser, S., Lin, P., Englesbe, M. J., Bohnert, A. B., Kheterpal, S., & Nallamothu, B. K. (2017). New persistent opioid use after minor and major surgical procedures in us adults. *JAMA Surgery*, *152*(6), e170504. https://doi.org/10.1001/jamasurg.2017.0504

Dunn, L. K., Durieux, M. E., Nemergut, E. C., & Naik, B. I. (2017). Surgery-induced opioid dependence. *Anesthesia & Analgesia*, *125*(5), 1806–1808. https://doi.org/10.1213/ane.0000000000002402

Institute for Healthcare Improvement. (n.d.). *How to improve | ihi - institute for healthcare improvement*. http://www.ihi.org/resources/Pages/HowtoImprove/default.aspx

Shanthanna, H., Ladha, K. S., Kehlet, H., & Joshi, G. P. (2020). Perioperative opioid administration. *Anesthesiology*, *134*(4), 645–659. https://doi.org/10.1097/aln.0000000000003572

Shing, E. Z., Leas, D., Michalek, C., Wally, M. K., & Hamid, N. (2021). Study protocol: Randomized controlled trial of opioid-free vs. traditional perioperative analgesia in elective orthopedic surgery. *BMC Musculoskeletal Disorders*, *22*(1). https://doi.org/10.1186/s12891-021-03972-9

Wu, C. L., King, A. B., Geiger, T. M., Grant, M. C., Grocott, M. W., Gupta, R., Hah, J. M., Miller, T. E., Shaw, A. D., Gan, T. J., Thacker, J. M., Mythen, M. G., McEvoy, M. D., Argoff, C., Edwards, D. A., Gordon, D. B., Gulur, P., Hedrick, T. L., Holubar, S. D.,...Sun, E. (2019). American society for enhanced recovery and perioperative quality initiative joint consensus statement on perioperative opioid minimization in opioid-naïve patients. *Anesthesia & Analgesia*, *129*(2), 567–577. https://doi.org/10.1213/ane.0000000000004194